

REMARKS

Applicants have studied the Office Action dated June 25, 2003 and have made amendments to the claims. It is submitted that the application, as amended, is in condition for allowance. By virtue of this amendment, claims 1-10, 15 and 17 are pending. Reconsideration and allowance of the pending claims in view of the above amendments and the following remarks is respectfully requested.

In the Office Action, the Examiner:

- Rejected claim 10 for lack of antecedent basis for the limitation "the silicon" under 35 U.S.C. §112, second paragraph;
- Rejected claims 1, 2, 4, and 17 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) in view of Jang et al. (U.S. 5,637,529);
- Rejected claims 3 and 5 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2, above and further in view of one of ordinary skill in the art;
- Rejected claims 6-10 and 15 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2 above, and further in view of Lill et al. (U.S. 6,074,954) in view of Numazawa et al. (U.S. 6,168,996);
- Claims 1-3, 5-8, 10, 15, and 17 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 and 5-9 of U.S. Patent Number 6,537,873;
- Claim 4 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent Number 6,537,873, in view of Kircher et al. (U.S. 4,942,554); and
- Claim 9 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 5 and 6 of U.S. Patent Number 6,537,873, in view of Lill et al. (U.S. 6,074,954).

Rejection under 35 U.S.C. §112, second paragraph

As noted above, the Examiner rejected claim 10 for lack of antecedent basis for the limitation "the silicon" under 35 U.S.C. §112, second paragraph. As suggested by the Examiner, claim 10 has been amended to delete "the silicon." Accordingly, the Applicants respectfully submit that the Examiner's rejection of claim 10 has been overcome and the rejection should be withdrawn.

Rejection under 35 U.S.C. §103(a) in view of Kircher and Jang

As noted above, the Examiner rejected claims 1, 2, 4, and 17 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) in view of Jang et al. (U.S. 5,637,529). The Applicants respectfully traverse this rejection.

Kircher discloses a method for making a three-dimensional transistor cell arrangement. A trench 2 is etched in a highly doped silicon substrate 1. The trench is then filled with highly doped (arsenic) polycrystalline silicon 5. The polycrystalline silicon 5 serves as an electrode for the charge storage. The polycrystalline silicon 5, that fills out the trench 2, is etched back, creating a depression (illustrated by the arrow 6 of FIG. 4.). A silicon oxide 7 that functions as an insulation between the trench capacitor (1, 4, 5) and the later selection transistor is introduced, by deposition of the vapor phase (CVD), into the hole (6) produced in this way. After planarization from the surface, a polycrystalline silicon, or respectively, amorphous silicon 8 lightly doped with boron is deposited on the surface of the substrate. According to an alternative of the method, layer 8 recrystallizes during heating to temperatures of approximately 550 °C to about 660 °C (See Kircher at column 3, line 4 to column 4, line 20, and FIGs. 1 to 5).

As the Examiner correctly stats in his Office Action at Page 3: "*With regard to claim 1, Kircher [...] does not teach amorphizing the single crystal lattice*

around a periphery of a recess (39)." And goes on to combine Jang.¹

As an initial matter, Kircher is completely silent not only on "*amorphizing the single crystal lattice*" but more fundamentally, Kirsher is silent on a "substrate with a single crystal lattice" as well. In fact, the term single crystal lattice is nowhere suggested or taught by Kircher. Still further, Kircher does not disclose that "*a layer of amorphous material having the same chemical composition as that of the substrate*" is deposited on the amorphized single-crystal lattice. Moreover as explicitly taught by Kircher, after the recrystallization of amorphous silicon layer 8, there is still the silicon oxide layer 7. Thus, the amorphous material is not recrystallized "so as to be continuous with the single-crystal lattice of the initial substrate," which is the case as recited in the present invention. Accordingly, the Applicants respectfully submit that independent claims 1 and 17 of the present invention distinguish over Kirsher for this reason as well.

Turning now to Jang, disclosed is a method for forming an element isolation of semiconductor devices. A pad oxide film 33 is formed on a semiconductor substrate 31 and then, covered with a first nitride film 35. Thereafter, the semiconductor substrate 31 is subjected to dry etch, to form a trench 39. Subsequently, germanium ions are implanted in the semiconductor substrate 31 to form an amorphous region 43, followed by an SPE process to crystallize the amorphous region 43 (See Jang at column 2, lines 36-54, and FIGs. 1A, 1B, 1C).

The Examiner recites 35 U.S.C. §103. The Statute expressly requires that obviousness or non-obviousness be determined for the claimed subject matter "as a whole" and the key to proper determination of the differences between the prior art and the present invention is giving full recognition to the invention "as a whole." The Kircher reference taken alone and/or in view of Jang simply

¹ Applicants make no statement on whether such combination is even proper.

does not suggest, teach or disclose the patentably distinct limitation of (Emphasis Added):

forming a substrate with a single-crystal lattice, the substrate having a top surface with at least one discontinuity in the single-crystal lattice therein, whereby the top surface of the substrate has a recess at the discontinuity on the top surface;

amorphizing the single-crystal lattice around a periphery of the recess;

depositing a layer of amorphous material having the same chemical composition as that of the substrate; and

thermally annealing the amorphous material so as to be continuous with the single-crystal lattice of the substrate.

According to the Examiner on page 3 on his Office Action: "*It would have been obvious to one of ordinary skill in the art at the time of the invention to use the amorphizing of Jang in the method of Kircher in order to remove lattic defects.*" the claimed method. The Applicants respectfully disagree.

The Federal Circuit has consistently held that when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and the *prima facie* case of obviousness can not be properly made. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Here the intent, purpose and function of Kircher as combined with Jang as cited by the Examiner is to have the amorphization occur only in the bottom of the trench, and not around a periphery of the recess of the initial substrate. See Jang Fig. 1B. Accordingly, the present invention distinguishes over Kircher et al. as combined with Jang et al. as recited in independent claims 1 and 17 of the present invention for at least this reason.

Moreover, in the teachings of Jang the amorphous region is immediately crystalized. This combination, as suggested by the Examiner, destroys the intent and purpose of Kircher taken alone or in view of Jang. Accordingly,

independent claims 1 and 17 of the present invention distinguish over Kircher taken alone or in view of Jang for this reason as well.

Further, Applicants submit that the combination of Kircher with Jang teaches away from "amorphizing the single-crystal lattice around a periphery of the recess." According to the combined teachings of Kircher and Jang, one skilled in the art would have amorphized the bottom of trench 2, then crystalized it. Thus, "depositing a layer of amorphous material having the same chemical composition as that of the substrate" would not be possible on an amorphized structure, but only on a crystalized one. Kircher explicitly teaches to deposit the amorphous layer 8 on the isolating silicon oxide layer 7, and not directly on the substrate. (See Kircher at least at col. 4, lines 7-31 and FIGs 5 and 6.) Accordingly, independent claims 1 and 17 of the present invention distinguish over Kircher taken alone and/or in view of Jang for at least this reason as well.

Continuing further, when there is no suggestion or teaching in the prior art for "amorphizing the single-crystal lattice around a periphery of the recess . . . depositing a layer of amorphous material having the same chemical composition as that of the substrate" the suggestion can not come from the Applicant's own specification. The Federal Circuit has repeatedly warned against using the Applicant's disclosure as a blueprint to reconstruct the claimed invention out of isolated teachings of the prior art. See MPEP §2143 and *Grain Processing Corp. v. American Maize-Products*, 840 F.2d 902, 907, 5 USPQ2d 1788 1792 (Fed. Cir. 1988) and *In re Fitch*, 972 F.2d 160, 12 USPQ2d 1780, 1783-84 (Fed. Cir. 1992). The prior art reference Kircher does not even suggest, teach nor mention a "single crystal lattice."

Furthermore, Kircher and Jang do not suggest, teach nor mention obtaining a substrate with a single-crystal lattice which makes it possible to repair the local defects, to ensure planarity and surface homogeneity allowing the formation of an epitaxial layer of silicon free of crystal defects (page 2, lines 7-14 of the specification). Kircher et al. do s not mention a substrate with a single-crystal

lattice, or provide a transistor cell arrangement with a low area requirement per cell, whereas Jang et al. provides a method for forming an element isolation insulating film of semiconductor devices which can reduce junction leakage current.

For the foregoing reasons, independent claims 1 and 17 distinguish over Kircher taken alone or in view of Jang. Claims 2, and 4 depend from claim 1, since dependent claims contain all the limitations of the independent claims, claims 2 and 4 distinguish over Kircher in view of Jang, as well, and the Examiner's rejection should be withdrawn.

Rejection under 35 U.S.C. §103(a) in view of Kircher et al.,
Jang et al. and Official Notice

As noted above, the Examiner rejected claims rejected claims 3 and 5 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2 above and further in view of one of ordinary skill in the art.²

For the foregoing reasons in the section above entitled "Rejection under 35 U.S.C. §103(a) in view Kircher and Jang", independent claim 1 distinguishes over Kircher taken alone or in view of Official Notice. Claims 3, and 5 depend from claim 1. Since dependent claims contain all the limitations of the independent claims, claims 3 and 5 distinguish over Kircher in view of Examiner's statement of ordinary skill in the art as well.

² Applicants make no statement on whether such combination is even proper. However, if the Examiner's statements are based on facts within the personal knowledge of the Examiner, the Applicants respectfully request that the Examiner support these references by filing an affidavit as allowed under MPEP §707 citing 37 CFR 1.104(d)(2).

Rejection under 35 U.S.C. §103(a) in view of
Kircher et al., Jang et al., Lill et al. and Numazawa et al.

As noted above, the Examiner rejected claims rejected claim 6-10 under 35 U.S.C. §103(a) as being unpatentable over Kircher et al. (U.S. 4,942,554) and Jang et al. (U.S. 5,637,529) as applied to claims 1 and 2 above and further in view of Lill et al. (U.S. 6,074,954) and in view of Numazawa et al. (U.S. 6,168,996);

For the foregoing reasons in the section above entitled "Rejection under 35 U.S.C. §103(a) in view Kircher and Jang", independent claim 1 distinguishes over Kircher taken alone or in view of Official Notice. Claims 6-10 and 15 depend from claim 1. Since dependent claims contain all the limitations of the independent claims, claims 6-10 and 15 distinguish over Kircher and Jang in view of Lill and Numazawa as well.

Rejection under Double Patenting

As noted above, the Examiner rejected claims 1-3, 5-8, 10, 15, and 17 are rejected under the judicially created doctrine of obvious-type double patenting as being unpatentable over claim 1 of U.S. Patent Number 6,537,873, and claim 4 as being unpatentable over claim 1 of U.S. Patent Number 6,537,873, in view of Kircher et al. (U.S. 4,942,554); and claim 9 is rejected under the judicially created doctrine of obvious-type double patenting as being unpatentable over claims 1, 5 and 6 of U.S. Patent Number 6,537,873, in view of Lill et al. (U.S. 6,074,954). In response to this rejection, the Applicants have filed a Terminal Disclaimer which fully complies with 37 CFR § 3.73(b). Applicants respectfully submit that the Examiner's rejection under the judicially created doctrine of obvious-type double patenting has been overcome and that claims 1-3, 5-8, 10, 15, and 17, and 4, and 9 are now in a condition for allowance which allowance is respectfully requested.

CONCLUSION

The remaining cited references have been reviewed and are not believed to affect the patentability of the claims.

In this Response, Applicants have amended certain claims. In light of the Office Action, Applicants believe these amendments serve a useful clarification purpose, and are desirable for clarification purposes, independent of patentability. Accordingly, Applicants respectfully submit that the claim amendments do not limit the range of any permissible equivalents.

Applicants acknowledge the continuing duty of candor and good faith to disclosure of information known to be material to the examination of this application. In accordance with 37 CFR §1.56, all such information is dutifully made of record. The foreseeable equivalents of any territory surrendered by amendment is limited to the territory taught by the information of record. No other territory afforded by the doctrine of equivalents is knowingly surrendered and everything else is unforeseeable at the time of this amendment by the Applicants and their attorneys.

Applicants respectfully submit that all of the grounds for rejection stated in the Examiner's Office Action have been overcome, and that all claims in the application are allowable. No new matter has been added. It is believed that the application is now in condition for allowance, which allowance is respectfully requested.

PLEASE CALL the undersigned if that would expedite the prosecution of this application.

Respectfully submitted,

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